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# EVALUATION OF POST HARVEST PHYSIOLOGICAL DETERIORATION FROM CASSAVA WILD RELATIVE (Manihot walkarae) FOR GENETIC IMPROVEMENT

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**ABSTRACT**
Crop wild relatives offer a great opportunity for plant breeders by providing a valuable source of genes that can be used to develop crops of valuable traits. Root of seventy one Genotypes from second backcross ($BC_2$) population from wild relative, *Manihot walkerae* were evaluated for postharvest physiological deterioration in two cropping seasons in National Root Crops Research Institute (NRCRI) Umudike 7, 14 and 30 days after harvest. Results showed that most of the genotypes were highly tolerant (0-5%) and partially tolerant (5-35%) to ppd. Result also showed that two genotypes attained zero ppd at 30 days after harvest in half sib populations B1PD 280 and B1PD 289 respectively.

**Keywords: Backcrosses, PPD and Genotypes**

## Introduction

Cassava is the most important staple food in Africa and the principal source of calories for more than 500 million people from mainly poor populations of the tropical regions (Egesi *et al.*, 2007). In addition to the important role cassava plays in food security, there is growing demand for cassava roots by the starch, food, animal feed and ethanol industries (Ceballos *et al.*, 2007). Cassava roots have a very short shelf life because of postharvest physiological deterioration (PPD). The short shelf-life severely limits the marketing options because it increases the likelihood of losses, marketing costs, and access to urban markets is limited to those close to the production sites. PPD begins with vascular streaking, which is a blue- black discoloration of the xylem parenchyma, followed by general discoloration of the storage paranchyma and displays other undesirable organoleptic properties (Reilly *et al.*, 2007). One of the sources of post harvest physiological deterioration (PPD) has been identified in an interspecific cross between *M. esculenta* and *Manihot walkerae* . Backcrossing has been used extensively to introduce new sources of traits from wild *Manihot* species (Akinbo *et al.*, 2012). It also creates an opportunity to increase the genetic variability especially in interspecific crosses, which allow for the incorporation of new and valuable traits such as tolerance to post-harvest physiological deterioration (PPD), resistance to pest and diseases, high dry mattter content and high protein content. The objective of this study is to evaluate the second backcross population ($BC_2$) from *Manihot walkerae* for delayed post-harvest physiological deterioration at 7 , 14 and 30 days after harvest.

## Methodology

The materials used for this study were seventy one genotypes of second back cross population from *Manihot walkarae*. The experiment was carried out in National Root Crops Research Institute, Umudike. Commercially sized roots from the harvest with a minimum lenght of 18cm, without mechanical damage and with no pre-harvest rotting visible was selected and used for the evaluation. The proximal and distal root ends were cut, ensuring that the remaining root section is at least 15cm after cutting the ends. The distal end of the root was covered with PVC film in order to maintain moisture content of the distal end and inhibit the developement of deterioration from this end of the root. Post harvest physiological deterioration (PPD) evaluation was

carried out on the 7th., 14th, and 30th day after harvest. Seven transversal slices were cut along the root (2cm), starting at the proximal end. A score ranging from 0 to 10 was assigned to each slice, based on the extent of physiological deterioration on the surface of each slice of the root. The mean PPD score for each root was calculated by averaging the scores of the seven transversal sections (Wheatley et *al*., 1985).

**Results and Discussion**

Using specific levels of PPD, first year result shows high tolerance of PPD in most of the genotypes at 7 and 14 after harvest. Two genotypes maintained zero PPD at 30DAH in half sib populations B1PD 280 and B1PD 289 respectively (fig. 1). Simple statistics in the first year with mean PPD values across genotypes indicated that most of them were partially tolerant to PPD (Table 2). High level of tolerance was also attained in the second year evaluation. Majority of the genotypes were highly tolerant at 7 and 14 days after harvest (fig. 2). The mean values of PPD across the genotypes in the second year at 7 and 14 months after harvest also shows that greater part of the genotypes were highly and partially tolerant (Table 3). The discovery and use of resistance genes from wild relatives have steadily increased in different crops (Carabali *et al*., 2010; Akinbo *et al*., 2012). For several years, CIAT has been working to introgress the tolerance to PPD found in the wild relative *Manihot* walkarae. Interspecific cross was originally made with the elite genotype SM909-25 and then a first backcross was made to generate family BC289. Interspecific cross was also crossed to an elite clone MTA18 to produce the family BC284. Many genotypes were generated and evaluated in theses two backcrosses (Cuambe, 2007). Drastic reduction in PPD has also been found in a half-sib B1PD280 population from resistant parental CW429-1 (Rosero *et al*., 2010). Result from this study showed reduction to PPD which indicates the potential of gene introgression for resistance to PPD from the wild relative of cassava *Manihot walkerae*.

**Conclusion**

In conclusion, the identification of this source of tolerance suggest that there was a successful gene introgression which can be used to solve the problem of postharvest phsiological deterioration in cassava , benefitting millions of local and commercial farmers.

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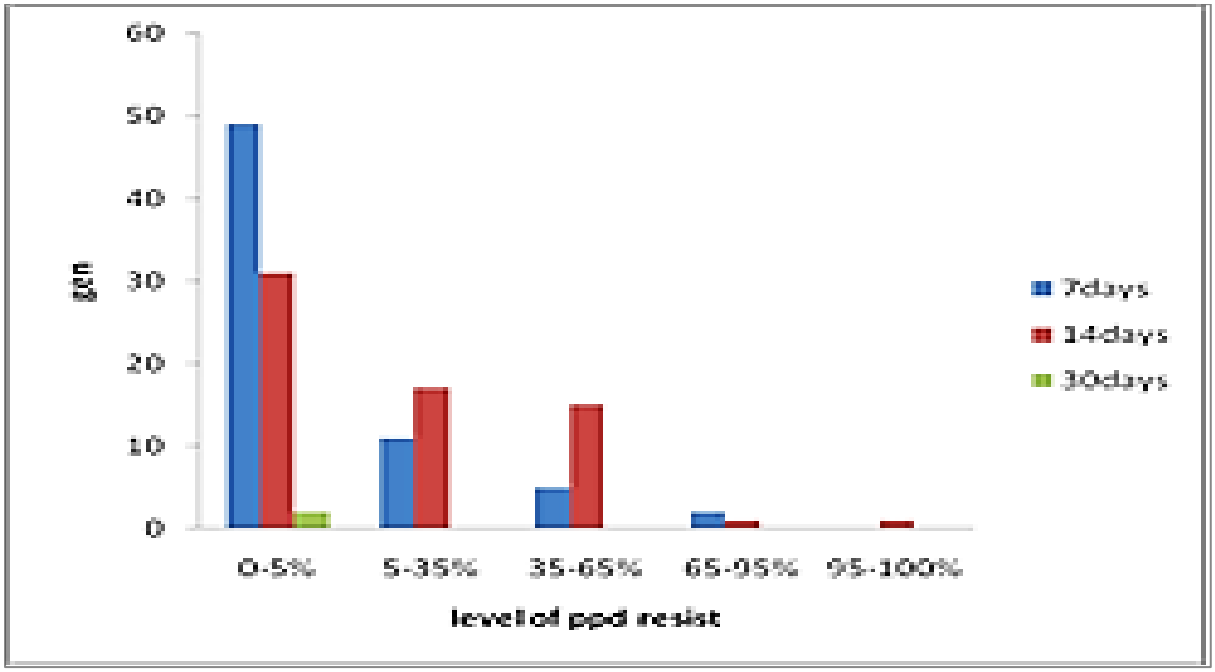
**Table 1: The percentage mean PPD score for each root**

| Score | PPD% |
|---|---|
| 0 | No PPD |
| 1 | 10% |
| 2 | 20% |
| 3 | 30% |
| 4 | 40% |
| 5 | 50% |
| 6 | 60% |
| 7 | 70% |
| 8 | 80% |
| 9 | 90% |
| 10 | 100% |

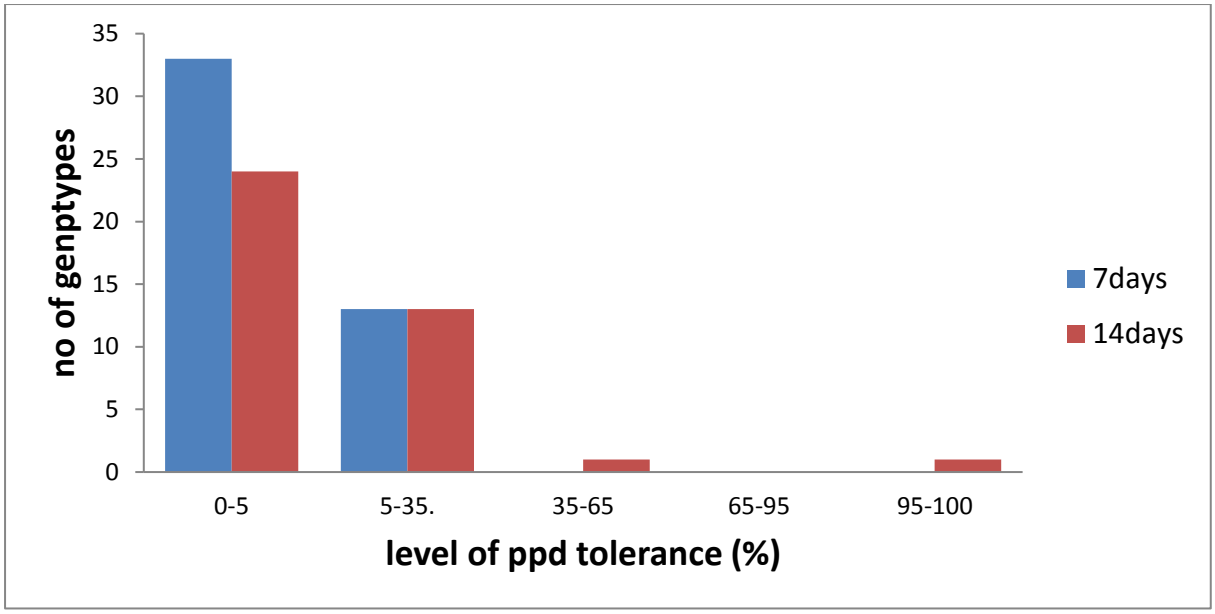



*0-5% highly tolerant; 5-35% partially tolerant; 35-65%Intermediate; 65-95% Susceptible; 95-100% highly susceptible*

**Fig 1: Frequency of $BC_2$ population in PPD evaluation on the 7 and 14 DAH (YR1)**

**Table 2: Simple statistics of post harvest physiological deterioration (PPD) genotypes of the second backcross ($BC_2$) population evaluated in yr1**

| Variables | Minimum | Maximum | Mean |
|---|---|---|---|
| PPD (7DAH) | 0 | 70 | 8.62 |
| PPD (14DAH) | 0 | 100 | 20.87 |




*0-5% highly tolerant; 5-35% partially tolerant; 35-65%Intermediate; 65-95% Susceptible; 95-100% highly susceptible*

**Fig 2: Frequency of $BC_2$ population in PPD evaluation on the 7 and 14 DAH (YR2)**

**Table 3: Simple statistics of post harvest physiological deterioration (PPD) genotypes of the second backcross ($BC_2$) population evaluated in 2012**

| Variables | Minimum | Maximum | Mean |
|---|---|---|---|
| PPD (7DAH) | 0 | 34 | 3.92 |
| PPD (14DAH) | 0 | 100 | 11.59 |